DOCUMENT RESUME

ED 261 813 RC 015 446

AUTHOR	Mitchinson, Don F.
TITLE	Teacher's Manual for Outdoor Studies: Geneva Sixth Grades.
INSTITUTION	Geneva Public Schools, NY.
PUB DATE	1 May 83
NOTE	29p.; For student booklet, see RC 015 447. Illustrations may not reproduce clearly.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Activity Units; Class Activities; Conservation Education; Discovery Learning; *Environmental Education; *Experiential Learning; Field Experience Programs; Field Trips; Grade 6; *Group Activities; Intermediate Grades; *Learning Activities; Natural Resources; Observational Learning; *Outdoor Education; *Science Activities
IDENTIFIERS	Geneva Public Schools NY; *Rogers Environmental Education Center NY

ABSTRACT

Written for teachers who lead their 6th grade students on a 3-day field experience program at the Rogers Environmental Education Center in Sherburne, New York, this manual provides objectives, materials, and procedures for activities which help students learn about the natural environment--pond life, trees, ecology of the forest floor, stream flow, food chains, food supply, animal tracks, and contour mapping. Projects require from 1-3 hours to complete and use the Center's library and laboratory as well as various outdoor sites. Pond life study includes an introduction to pond ecology, collecting and identifying sample plants and animals, using a microscope and bioscope, and discussing student observations. Forest study incorporates constructing a Biltmore stick to measure tree diameter, estimating tree height, inferring growth conditions from cross sections of trees, and making an inventory of life and signs of life within a 5-foot-square plot of the forest floor. Lessons in stream flow include directions for making and racing cork boats and using flow meters. Other activities include an auction to create awareness of environmental values and simulation games to illustrate the dynamics of food chains and food supply. Four problem-solving situations are included, each demanding group cooperation to meet a physical challenge. (JHZ)

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Geneva Outdoor Studies at the Rogers Envir. Educ. Center

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TEACHERS MANUAL

RC015446

TEACHER'S MANUAL FOR OUTDOOR STUDIES:

GENEVA SIXTH GRADES

Don F. Mitchinson

Director of Outdoor Studies

May 1, 1983

The Geneva Public Schools

400 W. North Street

Geneva, New York 14456

ACTION SOCIALIZATION EXPERIENCE (ASE'S)

PURPOSE: To give groups of students a series of clearly defined, physical problems. They are designed so that each group must attempt to work out its own solution. This problem-oriented approach can be useful in developing each student's awareness of decision-making, leadership, and the obligations of each member within the group. Participants work on the problem in groups in order to take advantage of the compined physical and mental strength of a team. These group problems also promote a student's sense of his own competence as an individual who can dare to become involved in a group.

Once the problem is clearly defined and understood, with ground rules and safety standards explained, the supervisor should allow the group to formulate their own plan of action. Trial and error methods will probably result, but if pre-planning is conducted by the group a reasonable plan of action should result.

SITE #1 The Giant Bomb

Object: A mad scientist plans to blow up the world with a donut shaped bomb. To thwart any attempts disarm it he has placed it over a tall pole. It can only be turned off by removing it from the pole. You may use sticks to lift it off the pole but be careful. If the bomb touches the pole it will explode on contract. Hurry! It's set to go off in 12 minutes.

Props: pole, tire, 8-10 window rods.

Rules and considerations: If the tire touches the pole they must start again from the beginning.

Cautions: Care should be taken with the rods so that they don't slip and strike anyone.

SITE #2 The Poseidon Adventure

Object: To get all members of a group out of the hull of a sinking ship through a small opening so that all can be saved before the vessel sinks.

Props: 5/8" mainila rope, tire, bowline.

Rules and considerations: The group tries to get each member through the suspended tire. The last person receives no aid in getting up, but can be helped down.

SITE # 3 All Aboard

Object: The group was enjoying a pleasure cruise of the South Seas aboard a luxury yackt when it struck a coral reed and sank, leaving everyone afloat. However, a small life raft bobbed to the surface and just in time, too, because a swarm of man-eating sharks has been spotted in the distance. Everyone must get up on the raft without any part of their body touching the water (ground).

Props: 2' x 2' x 3/4" sheet of plywood supported by a 4" x 4" beam framework securely anchored in the ground 18" high.

Rules and consideration: In order to be counted as on the platform, a student must have both feet off the ground.

The students must be able to hold their balanced pose for at least 10 seconds.

SITE #4 The Acid Swamp Crossing

Object: To transport a group over a swampy mass of bubbling acid using rubber rafts strung together to form a foot bridge.

Props: 4 - 4 foot by 1 foot pieces of plywood.

Rules and considerations:

1. The route across the "swamp" is 50 feet.
2. Anyone touching the surface of the "swamp" after starting the crossing is lost.
3. If a member of the group is lost, the entire group must start again from the beginning.
4. The time limit is 12 minutes. The acid will be destroyed the rubber rafts in that time.

Cautions: Care should be taken in passing the "rafts" from the rear to the front. No one should jump from the "shore" to the "rafts."

POND LIFE: "WHAT LIVES HERE?"

SUMMARY

Pond investigation provides students with a "hands on" learning situation. Students will understand the makeup of a pond by means of collection and identification.

OBJECTIVES:

1. Student will become aware of the variety of organisms in the pond community and the interrelationships occuring within.

2. Students will learn the skills necessary to collect, identify and transport specimens safely.

3. Students will learn to use laboratory apparatus safely and correctly.

POND STUDY INTRODUCTION:

Ponds are constantly changing bodies of water that are shallow enough to allow rooted plants to emerge at any point in the pond. A complex community of organisms is supported by every pond. The suns energy is stored in green plants and serves as the building block for the process known as the food chain. This interdependance between animal and plant is the basis for energy transfer in the pond. A great number of these energy fixing plants are microscopic and are referred to as phytoplankton. They are, in a sense, food factories. Herbivores eat the plants and in turn are eaten by the preditors. Of equal importance to the life processes of the pond are the decomposers and scavengers, both of which help to break down and return nutrients from decaying organic material.

In a pond, plants and animals are slowly being replaced by species better suited to the changing conditions. This process of natural selection is called succession. In this process, one community or organism is outcompeted and replaced by another. A pond usually starts out as a sterile, lifeless body of water. It then progresses to a mature pond, teeming with a wide variety of organisms. An old pond will have fewer types of organism, but in greater abundance. Eventually, the pond will fill with sediments and decaying material to become a meadow and finally a forest.

ACTIVITY PREPARATION:

A successful pond study can be achieved by using the "discovery approach." Teachers familiarize themselves with the equipment and its uses. Teachers will read the introduction and attain a basic understanding of pond ecology. Golden Field Guides are included and will help identify most of the specimens found, at least to Family or Genera. This lesson incorporates three components: a classroom introduction to pond ecology, using provided charts. Collection and examining specimens and a sharing session are also included. It is advisable to set up the classroom and equipment in advance of the class' arrival.

STUDY SITE:

The pond study will take place at the education building with investigations on the pond near the main building.

SAFETY:

Misuse of equipment can cause damage to student and gear. Discourage such activity.

ACTIVITY PLAN: "What Lives Here?"

1. Have students meet at the lab. room, seat them and introduce the lesson; (What, how, Why).

    a) what: investigate the life forms in the pond

    b) why: a pond is a teaching aid to introduce basic biological and ecological concepts.

    c) how: collecting and observing specimens.

2. Explain that some ponds are naturally occuring, having been formed by glacial digs or erosion. Others are man-made or altered by other means, such as the beaver. Introduce the concept that ponds are communities, just as our towns and cities are communities. Plants and animals living together, providing the essentials for life, (food, shelter, space to grow).

3. Point out that particular organisms have special needs and are suited for particular conditions, i.e. crayfish living in mud banks, large fish in open water. An organism's surroundings or living space is referred to its habitat (where you are most likely to find that particular organism. Point out the various plants and animals on the chart and the habitats they frequent; (water surface, open water, shoreline, pond bottom).

4. Every pond follows a pattern of birth, growing old, and death. Point out that growth, death, and decay of the pond organisms builds up a layer of material on the pond bottom. In time this layer will change the makeup of the pond.

5. The sun is the basis of all life. Green plants utilize the suns energy, making the food-stuffs on which other organisms rely.

6. Introduce the students to the concept of team discovery using the "buddy system". Divide the students into groups before leaving the building.

7. Demonstrate the proper use of the dip nets. Show how to safely transfer the specimens to the collecting jars or pans.

8. Each team is going to investigate and collect sample organisms from the pond.

    a) water surface-long dip net, collecting jar, hand lens, collection enamel pan, pond guides, bottom sampler. Give specified equipment to each group, set the boundaries for their investigations and direct them to the areas.

9. Set up the microscopes in the lab. Using the eye-dropper, put a few drops of pond water on the slide and put a cover on the water. Search for plankton or green plants. As the students view the specimen, tell them how the microscopic plants provide the basis of all pond life.

10. After 15-20 minutes call your students back to the table. Have them transfer their specimens from the collecting jars to the white sorting trays. Give them time to sift through their findings and identify what they have found. Be available for questions and comments. Usse the pond guides for reference and identification of the critters.

11. After most of the organisms have been identified, have a sharing session. Have team members share discoveries and allow enough time for every member to participate. Use the bioscope to share microscopic specimens.

12. After the sharing session have students return <u>all</u> specimens to the area from which they were taken. Stress the need to pour <u>gently</u> the entire contents back into the pond.

    Clean all the gear and re-pack it.

WHAT DO YOU THINK? (Discussion questions)

1) What were the most interesting things about the pond or its critters?

2) At what point in its life is our pond?

3) Discuss interdependence, who needs who?

4) How do plants and animals get through winter?

5) Does weather affect the life in a pond? How?

SKETCH YOUR CRITTERS (time permitting)

1) Draw a picture of your animal.

2. Use pond guides to identify and label your picture.

The Biltmore Stick

Making a Biltmore Stick

1. Either: a. Cut a piece of cardboard or heavy paper to the length and width of a yardstick and affix it to one side of a yardstick.
   b. Cover one side of a yardstick with masking tape.

2. Mark the yardstick according to the following chart.

Inches from end of yardstick	tree diameter
5 7/16	6"
7	8"
8 8/16	10"
9 15/16	12"
11 5/16	14"
12 9/16	16"
13 15/16	18"
15	20"
16 3/16	22"
17 5/16	24"
18 6/16	26"
19 6/16	28"
20 7/16	30"

Using a Biltmore Stick

1. Hold the Biltmore stick 25" from your eye, at right angles to your line of sight.
2. Hold the zero end even with the left side of the tree, and without moving your head look to see where the right side of the tree is in relation to the scale.
3. The mark on the scale is the tree diameter.

(The stick should touch the tree 4 1/2 feet above the ground while measuring)

		Diameter												
		10"	11"	12"	13"	14"	16"	18"	20"	22"	24"	26"	28"	30"
Height	15'	39	49	59	71	83	110	140	180	220	270	320	370	420
	24'	51	64	78	96	112	150	200	250	300	370	440	510	590
	32'	63	80	98	120	141	190	250	310	390	470	560	650	760
	40'	72	92	112	138	164	220	290	370	460	560	660	780	900

These are volumes measured in board feet (lbd.ft. = 1"x12"x12")

HOW TO FIND THE NUMBER OF LOGS IN A TREE

Make marks on the reverse side of the stick;

at 6 1/4 in. from the end mark 1

at 12 1/2 in. from the end mark 2

at 18 3/4 in. from the end mark 3

at 25 in. from the end mark 4

Stand 66 ft. from the tree and hold the stick vertically 25 inches from your eye with "0" (end of stick) at the stump level. The marks show the number of 16 foot logs in a tree. Measure only in increments of 16 feet until the truck branches or forms a crotch.

STUDENT ACTIVITY

Activity Title: Constructing and Using a Cruising Stick

Strand Objectives: Variety and Similarity, Patterns

Specific Objectives: To learn how to use a cruising stick to estimate tree height

Materials: Yardstick, marking pen, pen

Procedures

Pre-Site: Timber cruisers, men who determine how much commercial wood there is in a forest stand, can use cruising sticks to measure a tree's height. (This is just one of several methods.) Knowing the height of the tree and its diameter makes it possible to figure the amount of wood in the tree. Discuss the dimension called a "chain," which is 66 feet. One of the students might do some research on the "chain" and why it is 66 feet.
Begin at one end of stick and mark increments according to instructions in the Teachers Guide.

On-Site: To measure the tree, stand 66 feet (one chain) from it. Hold arm out horizontally and the stick vertically at arm's reach--25 inches from eyes. Slide stick up or down until top of stick is in line with top of tree. Without moving head, sight to bottom of tree (be sure stick is still vertical), and see place on stick where line of sight crosses it. The nearest figure is the number of 16' lengths in the tree. If the figure is 3, there are 3 16-foot lengths. The tree is 48 feet high--3 x 16 feet.

Post-Site: Why would this kind of measurement be important to a logging operation? Did most of the trees you measured have quite a bit of wood in them? Suggest that it is important economically to know approximately the worth of a tree so that loggers and owners can be fair with one another. Would you like to be a timber cruiser? How do you suppose he/she learns his/her job?

a lesson plan for

SOME FOREST INVESTIGATIONS

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example, "In this session we will develop some skills in collecting, recording, and interpreting data about the forest, and then communicate these interpretations using different methods and processes."

Note to facilitator: Both the metric and English systems of measurement are included in the lesson plan. If it has not already been determined, you should discuss and decide with the group which system will be used.

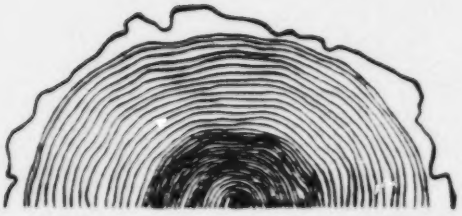
I. OBSERVING AND INFERRING WITH CROSS SECTIONS.

Distribute cross sections of trees 4"–6" (10–15 cm.) in diameter that show a variety of growth patterns and influences (fire, insects, etc.).

Have people spend a few minutes looking at the cross sections (5 minutes).

Questions and Discussions

1. "What are some of the things you noticed about the cross section?" List on board.
2. Point to two or three items from the list that deal with growth characteristics and rings (varying widths of growth rings, center not in the middle, etc.).
   "What are some possible reasons for _____?" Select some observations.
3. "In general, what could growth rings tell us about a group of trees?" (competition, climate, temperature)
4. Pass out Tasks A and B. "This is what we just did and here is the task card for your reference later."
   Refer to the information on Task A about tree growth rings.



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II. COLLECTING AND INTERPRETING DATA ABOUT TREE GROWTH RATES AND COMPETITION

Task C (with tree cores) requires preparation by the facilitator before the session.

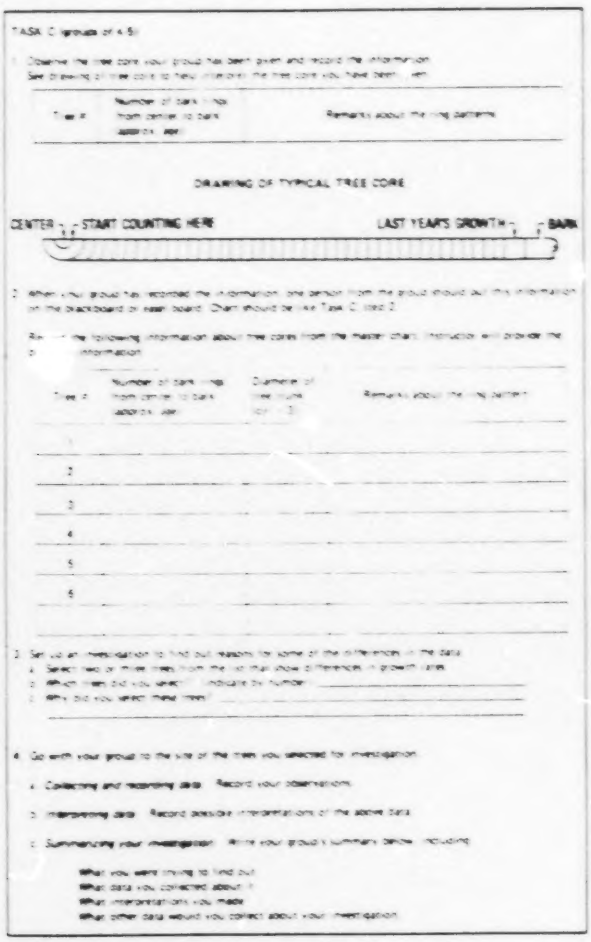
A tree stand should be selected for study, four to five trees tagged, numbered, and bored, and their diameters taken. Trees to be selected should show effects of environmental conditions—injury, overcrowding, lack of sunlight, etc. The tagged and numbered trees should be bored with an increment borer by the facilitator ahead of time. Cores should be numbered corresponding to numbers on trees. Taping tree cores to cardboard with see-through scotch tape or in plastic straws will help keep them longer if liquid resin is not available. In any event, keep the numbered cores and trees to use again. This eliminates the necessity of reboring the trees.

You may be able to find and use stumps of trees that grow under a variety of competititon influences, instead of using tree cores.

Steps 1–3 in Task C are all planning steps in setting up an investigation and should be done away from the study trees.

Questions and Discussion

1. "Observe the tree core that your group has been given and record the information in step 1 of Task C." Pass out hand lenses, pencils, the numbered tree cores taped to cardboard, and Task C. (10 minutes)



DRAWING OF TYPICAL TREE CORE

CENTER — START COUNTING HERE — LAST YEAR'S GROWTH — BARK

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2. Have each group tell you the information for the number of dark rings from center to bark and remarks about the ring pattern while you record on the large chart (see Task C, step 2). "What does this tell us about the trees these cores came from?"

3. Now put the diameters on the large chart and have everyone record them on Task C, step 2. Ask, "Now what does this added information tell us?"

4. "Go on to Task C, step 3. Pick out two or three trees from the chart that show differences in growth and set up an investigation to find out why there are differences."

5. Have the groups take Task C to the area where the trees are tagged and numbered. Have them spend 10–15 minutes doing the investigation and completing Task C, step 4.

6. (Outdoors) When all groups are finished, ask for a 2–3 minute summary from each group. "What did you find out?"

7. "What are some of the major factors that you think are affecting the growth of this forest?"

8. "What does the information tell us about the past events of this environment?"

III. OBSERVING EVIDENCE OF CHANGE

Pass out Task D.

Questions and Discussion

1. "What evidence of change (natural and manmade) might there be in this environment?"

2. "Spend the next 20 minutes looking for evidences of change and recording them on Task D." Pass out Task D.

TASK D

Look for evidence of change (natural and manmade) in the environment.
Record and fill out other columns.

Evidence of changes in the environment	What might have caused them?	Effect on the environment

Questions and Discussion

1. "What evidences did you find?" Have group develop a total list. Record on chart in front of total group, if possible.

2. "What could we do with this list?" This is a key question.

3. "Get into groups and put the whole list into a sequence." (Optional)

IV. OBSERVING AND RECORDING THINGS ABOUT A ROTTEN LOG OR STUMP

Move the group to a rotten stump or log.

1. "Let's focus in on one evidence of change in this rotten log (stump)."
2. Pass out hand lenses and demonstrate how to use them (many people have never used one before).
3. Go on to Task E. "Notice that on Task E it says, 'Do not tear the stump apart!' Why do you think this note is there? Spend 10 minutes observing the log and recording your observations on and interpretations of Task E."

TASK E (individuals or groups)

Do Not Tear The Stump Apart!

1. Record your observations and ideas below.

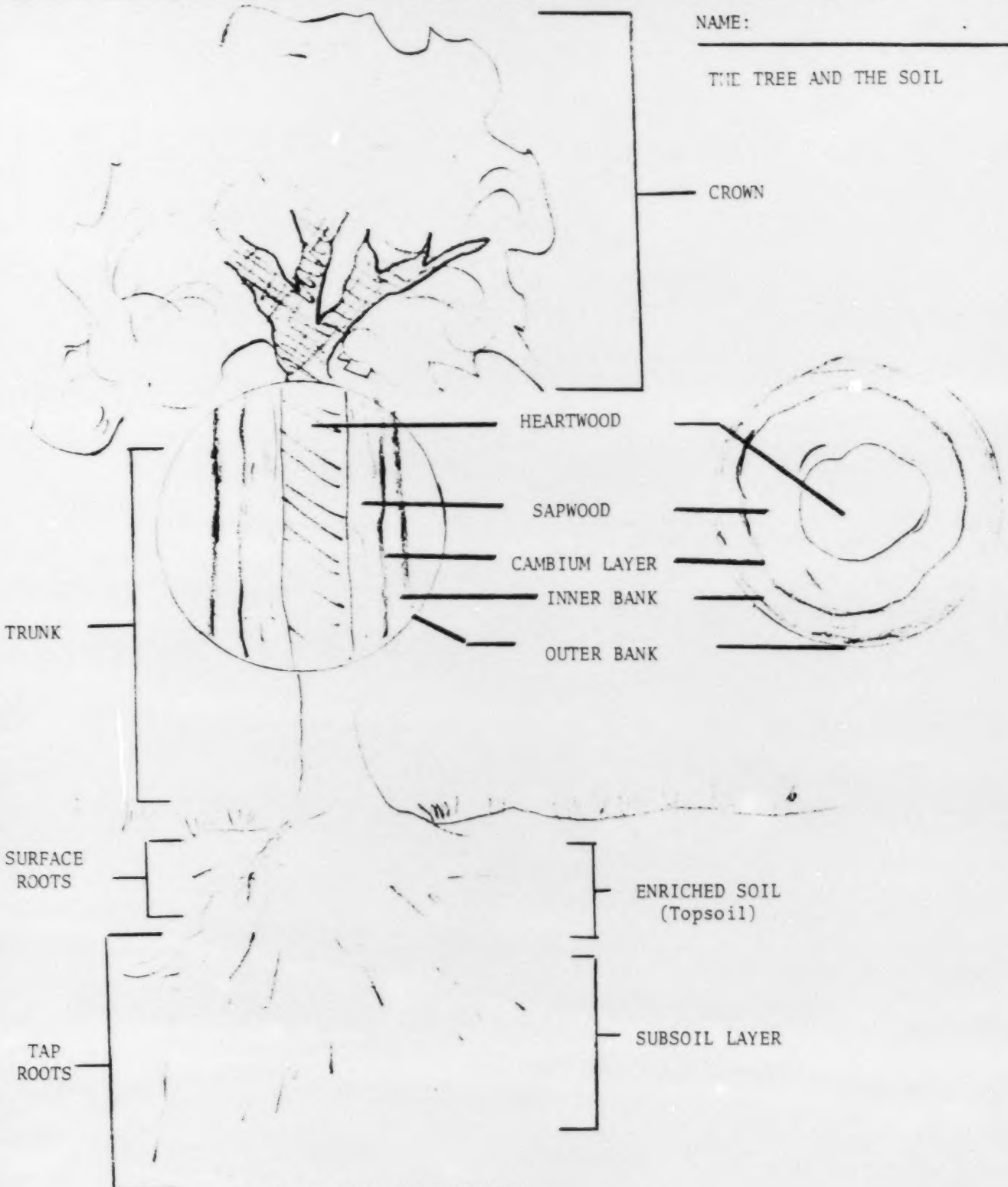
*Living things	Effect on stump
*Nonliving things	Effect on stump

2. In the space below, construct a diagram of one of the *cycles taking place in the rotten log or stump.

*You define the word *cycle* any way you want to.

NAME: _____

THE TREE AND THE SOIL



1. What does the bark do?
2. How is subsoil different from topsoil?
3. Which kind of soil is usually carried away first by water erosion?
4. What does it mean when a forest fire "Crown"?
5. How does walking a lot over one soil area change the soil and lives of the animals in it?

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$\frac{1}{10,000}$ OF AN ACRE

Approximate time needed for completion: 1 1/2 hours.

INTRODUCTION

A study of the forest community is an opportunity to learn about the living and non-living components of this environment and their interaction. Having the students investigate small study plots allows them to focus their attention on a small part of the forest that could actually be called a mini-community.

PROCEDURE

1) Walk along the Forest Ecology Trail and choose an area that is relatively open and accessible for the establishment of study plots.

2) Once the area is selected, have the students work in pairs to measure off their square plots on the forest floor. Each side of the square should be five feet long.

3) The first part of the activity will require that the students take soil and air temperatures and then determine the average temperature for their plots. Their mathematical skills will be tested again when they are asked to measure the height of one tall tree in their study plot using hypsometers. A diameter tape can also be used by the students to determine the diameter of this same tree. You may also want to have the students calculate the circumference of this same tree once they have found its diameter. (Circumference = d).

4) An important part of the forest study is to take a close look at the inhabitants of the forest floor. Encourage the students to investigate the forest litter very carefully and then record what they find. You might take the time to discuss decomposition and the process of recycling in nature using the forest soil as an example. Demonstrating the use of the soil sifters will help the students to realize the composition of the forest soil.

5) Your student investigators should also be looking for animal signs - tracks, droppings, burrows, nests, holes in trees or even half eaten nuts or seeds. Where the soil is moist, deer and raccoon tracks may be in evidence. Small holes in the ground or under rocks are good clues to the presence of chipmunks. Another chipmunk sign and also evidence of squirrels will be caches of partially eaten seeds and nuts under rotten logs or rocks.

6) The plant inhabitants in the study plots are not to be forgotten and the students will have a chance to identify the different trees that are growing in their plots. If the leaves are on the tree, the students should use the Master Tree Finder for this activity. Otherwise, the Golden Nature Guide, Trees, and A Field Guide to Trees and Shrubs can be used to identify the different types of trees.

7) When the students are finished with their study, remind them to leave their plots just as they found them. You may want to bring the group together and have the students discuss their findings about the forest at the end of the activity. This might also be a good time to have the students complete the diagram, The Forest-Apartment House Living.

GREAT STREAMBOAT RACE

CURRENTS IN A STREAM

A stream is a mass of water that carries sediment as it moves between banks, following the course of least resistance toward a lower elevation. The stream bottom may be rocky, muddy, or sandy. Rocky bottoms are usually found where the stream runs rapidly over a steep gradient.

Sandy and muddy bottoms may be found occasionally in pools of fast-flowing streams, but more often are in slow-moving, wide, and deep streams.

You may investigate the flow in any stream, but one that has some turbulence will produce more exciting results. Turbulence occurs when moving water meets obstacles which alter the course of the flow.

MATERIALS

For the race:
cork slices (boats)
window screen
marking pen
tacks
2 poles

For the speed check:
one-meter long sticks
cork slices
string
stopwatch or watch with a second hand
drawing paper
pencil

PREPARATION

Choose a turbulent stream site that is shallow and narrow enough for students to investigate all parts. Make cork boats by slicing corks into three disk-shaped pieces. Make a flow meter: To one end of a one-meter long stick, tie a string that extends one meter from the stick's tip. Fasten a cork to the free end of the string.
Make a hand screen: Tack a fine-mesh window screen onto two poles to make a hand screen for collecting the cork boats. The width of the screen should be as wide as the stream.

RULES FOR THE RACE

The purpose of this activity is to investigate the effects of obstacles on the flow of the stream. For best results establish a set of race rules with the participants, and penalize or temporarily disqualify any rule-breaker.

1. Each boat must be a slice of cork marked with the owner's initials.

2. The finish line is a hand screen held in place by participants (or rocks conveniently located) ten to twenty meters below the starting line. The main current of the stream must flow though the screen.

3. The Race Official (leader or designated student) releases all boats at the same time from the starting line.

4. The race course is marked off in four equal parts.

   In the event that a cork boat gets caught on an obstacle, the contestant has two choices he or she can move the obstacle (rock, log, etc.) or pick up the boat and take it backwards to the nearest dividing line and drop it in.

5. Participants may follow their boats downstream, but must not interfere with another contestant's craft.

6. The first boat to touch the screen wins.

RACE RESULTS

☐ What causes some boats to go more slowly than others?

☐ What causes some boats to get caught in places where they are not touching solid obstacles?

☐ What evidence suggests that there are currents of different speed and direction in the stream?

SPEED CHECK

This post-race activity allows contestants to investigate the rate of flow in different parts of the stream.

1. Divide the participants into two-member teams: one will be a flow-meter operator and the other a timer.

2. Provide each team with a flow meter and a stopwatch or other timing device.

3. Have each team mark off an area of investigation (three or four meters of stream).

4. Give instructions for use of the flow meter: the operator stands near the section of stream or current to be measured. At the timer's signal, the cork is dropped into the water. When the string tightens, the operator yells "Stop!" and the timer records the time in seconds per meter. During each trial, the tied end of the stick should be held as close as possible to the point where the cork was first dropped.

6. Ask the participants to locate and record the fastest and slowest currents in their sections of the stream.

7. Have them identify the physical conditions associated with the swiftest and slowest current areas.

8. When the teams have finished, gather the group together and compare results.

STUDENT ACTIVITY

Activity Title: Streamflow Study

Strand Objectives: Interaction and Interdependence, Patterns, Continuity and Change

Specific Objectives: To realize the importance of water and the requirements of each individual in today's life. To learn how to measure flow and volume. To apply mathematics procedures to a practical situation.

Materials: Float (ping pong ball), tape measure (50 ft.), identification stakes, stop watch or watch with second hand, pocket calculator, pencils and paper, screening.

Procedures:

Pre-Site: Introduce the students to this activity in class. Explain that they will be measuring stream flow, width, depth, and cubic feet of water. They should be familiar enough with mathematical functions and procedures to be able to handle the calculations involved. Have them do a simple problems. The students should also know conversion from cubic feet to gallons (or liters).

On-Site:

1. Use a designated open spot on the stream.
2. Select two students to measure a 25' section of the stream that is fairly straight and easy to approach.
3. Launch your float at the first stake and record in seconds the time it takes to float down the 25' section.
4. Measure the average width of the stream. Measure in three places. Record each.
5. Determine the average depth of the stream. Again,measure in three places and record each of them.
6. It is suggested that this be done twice for an average size class by combining two or three subgroups. This will allow all students to observe. The teacher may want each subgroup to do this.

Post-Site: Perform the calculations: Divide the distance, 25 feet, by the number of seconds to obtain feet per second. (Note: All measurements should remain in decimal forms if students can handle decimals. Otherwise, round the numbers off.)

Formula: 25 ÷ T = FPS. Divide the sum of the width measurements by the number of measurements to obrain average width. Example: 4 feet, 6 feet, 5 feet.

TOTAL: 15 feet $\quad 3 \overline{)\ 15}$ $\quad$ 5 ft. $\quad$ 5 feet is the average width.

Determine the average depth of the stream in the same way. Determine the cubic feet of water per second. Use the following formula: Average Width X Average Depth X Rate of Stream Flow (feet per second) = Cubic feet per second. Convert cubic feet of water to a more common measurement (gallons): 1 cubic foot of water = 7.48 gallons. To obtain gallons per second: Stream flow in cu. feet per second X Gallons in 1 cu. foot (7.48) = Gallons per second. Per minute: Gallons per second X 60 (seconds per minute) = Gallons per minute. Per day: Gallons per minute x 1440 (minutes per day) = Gallons per day. Assume that the average person uses 1000 gallons of water a day for home use. How many people could live from the stream that we measured? Total gallons ÷ 100 gallons per person per day = total number of people who could live from the water in the stream. Discuss the implications of your findings. Could there be a town or city here?

FOOD CHAIN GAME

OVERVIEW: In this activity, the youngsters investigate food chains by assuming the roles of animals that are part of a food chain.

BACKGROUND

The transfer of food from its source, plants, to one or more organisms is called a food chain. This transfer takes place when one organism eats another. The food chain in this game consists of four links:

plants----→ hoppers----→ frogs----→ hawks.

Popcorn represents the plants, and the youngsters play the parts of the grasshoppers (plant eaters), frogs (which eat grasshoppers), and hawks (which eat frogs). During each round, the "animals" must get enough to eat and avoid being eaten.

A population is a group of organisms of one kind that lives in the same area. In Food Chain Game the populations are so small that survival of two hoppers, two frogs, and one hawk (which can fly to find a mate) represents a "balanced" food chain.

CHALLENGE: STAY ALIVE BY GETTING ENOUGH TO EAT AND AVOIDING BEING "EATEN".

MATERIALS

For each "animal"	1 sash (See "Preparation".) 1 sandwich-bag "stomach" ("See Preparation".)
For each group:	4-5 liters of popped popcorn (or beans, acorns, etc.) 1 data board 1 marking pen 1 kitchen timer with bell (or a watch to be used with verbal signals) 1 roll of 2.54 cm (1 in.) masking tape

PREPARATION

Group size	You need at least twelve youngsters for this activity, but more youngsters add excitement to the game.
Time	Plan on thirty to forty-five minutes for the activity.
Sashes	Obtain three different colors of cloth for sashes. for every three players make two hopper sashes of one color, one frog sash of another color, and one hawk sash of the remaining color. (For twelve players, you would need eight hopper sashes, four frog sashes, and four hawk sashes.) Each sash should be about a meter long and 6-10 cm wide.
Stomachs	Make the stomach bags by placing strips of masking tape across each plastic sandwich bag so that the bottom edge of the tape is 4 cm from the bottom of the bag.
Site	Select a large lawn or other open level area that is suitable for a vigorous game of tag.

ACTION

1. Introducing food chains. Diagram the plants-->grasshoppers--->frogs--->hawks food chain on the data board, and display it to the group. Explain that the transfer of food from plants to one or more organisms is called a food chain and that you have drawn a food chain of four organisms.

2. Introducing the game. Explain to the youngsters that they are going to be playing grasshoppers, frogs and hawks in a food chain game. You may want to use a different food chain for the game, e. g. corn--->mouse--->snake--->hawk or plankton--->anchovy--->salmon--->sea lion, or [illegible] that the group suggests (perhaps one that includes humans.)

3. Spreading out the plants. Scatter most of the popcorn over the area, and explain that the popcorn represents plants that grasshoppers eat.

4. Assigning parts. Divide the youngsters equally into three groups, and distribute grasshopper sashes (most numerous) to one group, frog sashes to the second group, and hawk sashes to the remaining group. (You will have some hopper sashes left over.) Make sure that each youngster knows which animal he is playing. Ask everyone to wear his sash so it is plainly visible, e.g. around his head, arm, or waist.

5. Outlining the rules. Give each "animal" one "stomach". Explain that when the game starts, the grasshoppers will try to eat popcorn plants (put popcorn in their stomach bags), the frogs will try to eat grasshoppers (tag them), and the hawks will try to eat frogs (tag them). When a frog tags a hopper, the frog takes the hopper's stomach, and the hopper leaves the game. When a hawk tags a frog, the hawk takes the frog's stomach, and the frog leaves the game.

   This simulates the transfer of food when one organism eats another.

   a. Emphasize that hoppers can feed only on the popcorn plants on the ground, frogs can feed only ongrasshoppers, and hawks can feed only on frogs.

   b. Animals that are eaten (tagged) must wait on the sidelines for the next round.

   c. Announce that the round will last five minutes or until all of one kind of animal are eaten.

6. Play the game. Record the starting population numbers on the data board. State the challenge, set the time for five minutes and yell "GO!" The first round often lasts only a few seconds because all the hoppers or frogs are quickly "eaten".

7. Counting survivors. After the first round, record on the data board the number of each kind of animal that obtained enough food to survive. To survive, a hopper's stomach must be filled to the bottom of the tape (4cm) and a frog's stomach filled to the top of the tape (6½cm). Hawks need the equivalent of one frog with a full stomach to survive. Animals with less than a full stomach at the end of a round "starve to death".

8. Balancing the food chain. Explain that at least two hoppers, two frogs, and one hawk must be alive at the end of a five-minute round to have a "balanced" food chain. Ask the youngsters how they can change the game to produce a balanced food chain. Typical suggestions are:
    * Change the number of hoppers, frogs, and hawks.
    * Provide more plants (popcorn).
    * Set up safety zones for the hoppers and frogs where they are protected from attack.
    * Time releases, e.g. hoppers forage for thirty seconds before frogs "get up".

9. Playing again. Record on the data board the suggestion the group wants to try first, e.g. different numbers of organisms: twenty hoppers, eight frogs, and two hawks. Make the necessary sash changes, redistribute stomach bags, and return the popcorn to the activity site. Record starting populations, reset the timer, and play the game again.

10. Allow the youngsters to keep changing the rules and repeating the game until they end up with a balanced food chain. At the end of each round, record the number of survivors on the data board. Encourage the youngsters to compare the results after each round to help them figure out how to balance their food chain.

FOOD FOR THOUGHT

1. What population sizes of grasshoppers, frogs and hawks produced our balanced food chain?

2. What might happen if there were only half as many popcorn plants? No plants?

3. If there were no frogs, what might happen to the plant population? The hopper population? The hawk population?

4. What are some food chains that include humans?

ADDING LINKS

1. Look for evidence of plants being eaten in the activity site. What animals are responsible?

2. Find three possible links in a food chain in the activity site.

3. Play new versions of the food chain game that include one or more new organisms (people, scavengers, decomposers), or the effects of various factors (pesticides, a sudden population explosion or reduction of one of the organisms, a drought). For example, obtain a small amount of colored popcorn to represent pesticide-laden food. Three colored kernels might be fatal to hoppers, five for frogs, and ten for hawks.

DAILY FOOD SUPPLY

SUMMARY: All living things need nutrients. The food consumed must provide a certain amount of energy to meet the daily needs of the species metabolism.

OBJECTS:

1. Students will become aware of the need for good on a daily basis for most species.
2. Students will recognize the need for a predator/prey relationship to maintain a species and prevent over population.
3. Students will identify the specific needs of an organism in terms of both quantitative and qualitative.

MATERIALS:

1. Milk cartons (1/2 pint)
   a. 50 - blue
   b. 50 - orange
   c. 50 - pink
   d. 50 - brown
2. Student worksheets
3. Chart (for teacher demonstration)

PREPARATION:

Group Size: 10 to 12 students
Time: 45 to 50 minutes
Site: A trail or open area easily accessible from a central poing
Cartons: Milk cartons are disbursed over the area to be used in a random manner. (If the activity is to be repeated by another group, the students can re-distribute the cartons when they are done with them.)

PROCEDURE:

1. Explain to the group what a predator/prey relationship is and why it is important in the balance of nature. Ask for examples that they may already know.
2. Discuss why a species becomes extinct. Cite examples.
3. Use the chart to show that different sized species need a daily amount of food sufficient to provide them with energy to meet their activity demands.
4. Tell the students that they are going to pretend that they are small fish (black dace) living in a stream or pond. They must gather a one-day's food supply to survive. Their food is in the form of 1/2 pint milk cartons.
5. Send the group out to the designated area to collect cartons. They must carry as many cartons back in one trip as they can
6. When everyone has returned, distribute the student worksheets and have them total their score (energy points).
7. Discuss why some survived and others didn't. Can fish determine which food source has the most energy and gather only that kind?
8. Time permitting, collect all cartons and re-distribute them in the activity area.
9. Allow students to do the activity again, this time being selective of their food supply.
10. How many survived?
11. What would have happened if a predator came along that consumed fact?

ANIMAL TRACKS

OBJECTIVES: To develop an appreciation of wildlife by identifying species through their tracks; to "read" signs of tracks and determine if an animal is sitting, walking, or running.

MATERIALS:
* Set of animal tracks
* Assorted construction Paper (12x18)
* Roll of kraft paper
* Roll of masking tape
* Large stamp pads
* Stamp pad ink
* Pail of soapy water
* Paper towels
* Prepared chart of tracks
* Tracks books
* Rulers
* Flash cards

PREPARATION:
1. Cover several large tables with kraft paper.
2. Prepare pail of soapy water.
3. Ink pads if necessary.
4. Set out tracks and books.

PROCEDURE:
1. Introduce tracks to children by showing the prepared charts. Use the flash cards to help recognition of 4-5 easily identified tracks.
2. Demonstrate how to make the tracks of an animal sitting or standing on a piece of construction paper. (This activity is limited by animal size.)
3. Allow students to make an animal track print. Check for accuracy of spacing.
4. Group the students and have them measure out on the kraft paper the paces of an animal walking and then running. Use tracks and ink pads to print the actual track patterns. More than one animal pattern can be done on the same sheet.
5. Time and interest permitting, groups can recover the table with kraft paper to make other prints.

STUDENT ACTIVITY

Activity Title: Values Auction

Strand Objectives: Interaction and Interdependence, Adaptation and Evolution

Specific Objectives: To create awareness of personal values, especially as they are related to ecology

Materials: Ditto chart for each student, pencil, clipboard

Procedures

Pre-Site: Talk about "values." What does it mean? What does our culture value? How are values determined?

On Site:

1. Gather group where view is best. Ask: What does it mean to value something? For what reasons do we value anything? (Avoid naming specific objects or ideals at this point.) Probably some will say, "It costs a lot of money--I like it," etc. Hopefully, a few will mention ideas such as, "It is important in our lives, makes us feel good or happy, is beautiful," etc.

2. Hand out charts. Read over items briefly. Don't discuss yet.

3. Allow students a few minutes to observe the area around them and look for whatever they would like to add to their own list.

4. Regroup and tell students they have $500 in imaginary money to budget among the items on the list. They may put down a zero if they do not value a particular item at all, but all spaces in the "budget" column must be filled. "How much do you estimate each item is worth to you?" Allow about 10 minutes.

5. Conduct the auction. Items will be "sold" to the highest bidder. Pretend this will be your only chance to buy these things. No one can spend more than a total of $500, but individual item amounts may be changed from the budgeted amount. Put own top bid (even if not the winning bid) in the "My Bid" column. Enter top bid in the correct column and circle this amount if you won the bid.

6. When all items have been "sold," each student looks at his own sheet. Were budgeted items changed a lot? Did you change your mind about what you valued most as you went along? Were some decisions quite difficult to make and others easy? What kinds of things do you value most--material (those you could really buy) or things that may be beautiful or important to you but not worth money to someone else? (As teacher, be careful to pass no judgments here.)

Post-Site: Discuss reasons for value changes. Explore more carefully the reasons for American values.

Activity: Contour Mapping

Strand Objectives: Patterns

Specific Objectives: To make a Topographic Map indicating specific contour gradients.

Materials: 1 set-up of a contour mapping kit (CENCO) including Tray, Landform, Lid, Acetate Sheet, and Grease Pencil; contour maps for demonstration; graph paper (1/4 " sq.) Per 2 - students)

Procedures:

Pre-Site: Discuss how mapping helps us find direction, elevation, population, points of interest, roads. Study map symbols.

On-Site:

1. Trace on a U.S.G.S. map the contours. Show the elevations, and point out how the gradiations occur as the terrain changes.

2. Mark the side of the plastic trays by centimeters.

3. Add colored water to tray to reach level of 1 centimeter. Put on lid, locate acetate sheet, and trace outline of water level(contour). Repeat procedure for each centimeter.

4. Remove acetate sheet, and recopy contours on graph paper for a lasting copy of the contours of the landform.

Post-Site: make a wafer landform slicing a large potato and fanning the wafers.

Use paste-gauze to build a landform model and mark off the contours with marking pencil.